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## A Climb in the Cordillera of the Andes.

BY WILLIAM H. PICKERING.

Read December 13, 1893.

THE great range of the Andes consists, not as many people suppose, of a single line of high summits reaching from the Isthmus of Panama to the Straits of Magellan, but rather of several ranges placed more or less end to end. These ranges are separated by passes, or sometimes by broad level areas of considerable elevation and many miles in extent. To the west of these lies the Cordillera, which is composed of a long row of volcanic peaks, many of them at present extinct, or nearly so. In Chili these peaks coincide with the main range. In Peru and Bolivia the distance between the mountains proper and the volcanoes broadens out to between two and three hundred miles, the intervening table-land in general maintaining an altitude of from 12,000 to 15,000 feet. Upon this table-land lies the great lake of Titicaca, nearly one hundred miles in length and 12,500 feet above the sea, — the highest lake of its size in the world. It was upon the borders of this lake that the ancient Inca civilization took its origin, and not far from it, in Cuzco, that it reached the zenith of its magnificence. The relics of its former glory are still to be seen in the form of numerous gigantic ruins scattered over the country in different directions. Why the Incas should have chosen the section having perhaps the most disagreeable climate within their dominions to be the

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seat of their capital city, still remains a mystery. The mean temperature of this vast region is but a few degrees above the freezing-point, and the variation is but slight from one end of the coast to the other.

Lake Titicaca is connected with the sea by the Railroad of Southern Peru, which joins the town of Puno on the lake with the port of Mollendo. Upon this road, one hundred miles from the sea, lies the city of Arequipa, near which is located the Boyden Astronomical Station of the Harvard College Observatory. This station is situated at an altitude of 8,000 feet. Its horizon on the north and east is bounded by three extinct, or nearly extinct, volcanoes. To the eastward, at a distance of eighteen miles, lies the long ridge of Pichapicho, 18,000 feet in altitude; northwest, at a distance of ten miles, lies the Misti, 18,200 feet in height; while to the north, and twelve miles distant, is Chachani, with an elevation of 20,000 feet above the sea.

With such enticing summits so near at hand, we were not long in planning our first mountain excursion. This expedition was to the summit of the Misti, the nearest, and in some respects the most interesting, of the three mountains.

The party, which consisted of Messrs. S. I. Bailey, A. E. Douglass, G. T. Vickers, the present writer, and the guide, started on our climb at eight o'clock upon the morning of April 25, 1891. We rode fifteen miles to Chigüata and breakfasted, and then ten miles farther to the *Alto de los Hornos* (high plain of horses), where we passed the night. We slept out of doors in sleeping-bags made of goosey cloth lined with animal skins, as we did not care to try the beds, or public houses.

We did not start long, but were up by one o'clock in the morning, and off by two. I myself had slept about three hours out of a possible five. The moon was two days past the full, and gloriously brilliant. The altitude, as determined by the aneroid barometer, was 12,118 feet, and the temperature when we rose stood at 31° F. We mounted and rode to an altitude of about 13,000 feet. My guide's heart was then going like a trip-hammer, and he positively refused to move another step. We accordingly dismounted, and

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MT. CHACHANI, FROM THE AREQUIPA OBSERVATORY.

From a photograph by William H. Pickering.





began the ascent on foot. Our trail lay over loose scoriæ and sand lying at the greatest angle of possible slope. We had considerable baggage with us, including cameras, meteorological apparatus, sleeping-bags, wraps, etc.; and about a dozen porters had joined us at the *tambo* to carry our belongings to the summit.

We now had our first experience with Indian guides and porters, and found them in some respects rather unlike those of other nationalities. Having ascended various mountains in different portions of the world, and having been usually encumbered with more or less apparatus of various kinds, I had had some experience with persons of this class, and had always found them, when loaded down with thirty to fifty pounds of baggage, not very active companions. In fact, when I knew the way myself, and so could go ahead alone, it always became a question of how long I should have to wait for my porters upon the summit. Although I lay no claim to extraordinary speed as a climber, yet I have always found myself a fairly good walker upon mountain expeditions. So on this occasion, when I found that my baggage was rather more weighty than I had expected, and that my men must each be very heavily laden, it was with some annoyance that I looked forward to waiting for them several hours, high up upon the side, or perhaps on the very summit, of the mountain.

It is the general experience among climbers that one should not start off at full speed at the beginning of a climb, but rather take it more moderately and husband one's strength. I was therefore very much surprised to see these Indians, who certainly ought to have known their business, begin by rushing ahead at a rate of speed that I, entirely unencumbered with baggage, found it very difficult to maintain. It presently struck me rather forcibly that perhaps I should not have to spend so much time as I had anticipated on the summit waiting for my baggage. At this time I was doing my very best to keep up with my last porter, who was carrying perhaps fifty pounds upon his back. I soon abandoned the attempt, however; and away went guides, porters, and baggage up the mountain, and would soon have been lost to

sight, had it not occurred to some of them that perhaps, after all, it would be just as well to keep the foreigners in view. I have had many experiences with Indian porters since then, but their climbing capacity never ceases to fill me with amazement.

Having abandoned all attempts to keep up, our own party found that we were pretty well matched, and pretty fair climbers as white men go. But the trail was sandy and very steep, and the mountain side quite similar in structure to an ordinary railroad embankment. We had climbed to one thousand feet above where we had left our mules, and were now 15,000 feet above the sea, or three hundred feet higher than the summit of Mont Blanc. We kept along at a pretty fair pace, though we found climbing railroad embankments at that altitude rather wearisome. We began to notice now with regret that one of our party was slackening his pace a little. The farther we went the worse he became. Six hundred feet higher, and he gave it up entirely; mountain sickness was upon him in full force. The summit was evidently not for him. One of the others got out a small bottle of concentrated ammonia water, hoping to relieve him. Forgetting the natural consequences at such an altitude, he removed the stopper somewhat carelessly, and the contents immediately exploded, blowing the strong alkali into his face and eyes. Luckily for him plenty of water had been brought in our mules' packs, and had not been given to the Indians to carry. Its immediate application perhaps saved our companion's eyesight. The pain was nevertheless intense, and lasted for some hours. Thus we found that the dangers of high altitudes were not confined alone to the natural obstacles in our path. Calling back one of the Indians, we left our mountain-sick friend with him, while the rest of us, having partaken of a rather light breakfast, proceeded on our journey.

The slope now grew steeper, and extremely fatiguing. Later we climbed over loose lava, which was only a little less difficult than the loose sand. Perhaps owing to the twenty-five mile ride of the day before, and to the lack of sleep on the previous night, I was not in so good condition



EL MISTI, FROM THE AREQUIPA OBSERVATORY.

From a photograph by William H. Pickering.



for climbing as usual, but certainly it seemed to me that I had never undertaken such a difficult ascent before. We were now at an altitude of a little less than 18,000 feet, and I found I could only advance one or two hundred feet at a time, before I had to sit down to rest, and perhaps fall asleep. On awakening I would make another advance. In this way I found progress very slow. Towards the end, as the air pressure became less and less, I had to take my rests more frequently. At the very last it became necessary to cross a slope of loose sand and scoriæ, and I found it best to reduce my rests to a system. Accordingly I would take two steps, stop to breathe twice, then take two steps more, and so on. By this method I got on much faster than by trying to go farther with longer stops. The two others reached the camping-place, at an altitude of 18,440 feet, in rather better condition than myself, but we were all thankful to crawl into our sleeping-bags without spending much time upon our dinners. Our shelter was merely an overhanging shelf of rock; but it was all that we needed, as the night was not very cold. We all of us had severe headaches, and felt on the verge of nausea, and I myself had frequent attacks of gasping for breath. Under these circumstances I would lie on my back, open my mouth, and breathe like a fish out of water. It was certainly a very disagreeable sensation, for we seemed to be so helpless, knowing, as we did, that we had all the air that there was to be had. In the course of an hour or two my difficulties passed off, and I fell asleep. The two others, however, were less fortunate, and lay awake most of the night. The result was that when morning came I awoke refreshed and ready for another climb, whilst the others felt less actively disposed. Two of us, however, started shortly after breakfast for the rim of the crater, which we reached in about twenty minutes. The crater itself is double, the centre of volcanic energy having shifted, so that the new crater, which is circular, has impinged upon the old one, leaving it crescent-shaped. The bottom of the new one is perfectly level, and covered with sulphur, while from numerous vent-holes jets of steam are constantly arising. It is several hundred feet in depth, and perhaps one

third of a mile in diameter at the rim. The walls are extremely steep, and in some places nearly vertical.

As my companion did not feel inclined to proceed farther, I got a couple of Indians to carry my apparatus and guide me around the edge of the crater to a point upon the opposite side, which is the true summit of the mountain. We travelled for about a mile, most of the way over snow, but occasionally crawling around precipices and over rocky ledges. When I reached the summit, I was glad to lie flat on my back for ten minutes to recover myself. I then read the barometer, which stood at 25.012 inches, while the thermometer registered 54°. I next tried my pulse, which, contrary to my experience at lower elevations, was very faint, but registered 100. My breathing was 25. At Arequipa my pulse was 68, and my breathing 14. At sea-level both figures are usually somewhat higher.<sup>1</sup>

To avoid sunburn and snow-blindness my face had been coated with vaseline, and my eyes protected by dark spectacles and a blue veil; yet no sooner had I reached the summit than my eyes were attacked by a most painful smarting sensation, which rendered all observations entirely out of the question while it lasted, and only yielded to a prolonged rubbing with melting snow.

After securing a number of angles with the micrometer-level, we started upon our return at 12.45. Had the sun had now softened the snow, so that we occasionally sank in it nearly to our hips. My Indian guides, according to their custom, had gone ahead with the baggage, leaving me to find my way down alone, as best I could. Fortunately I had their footsteps to guide me, so that there was no danger of losing the trail. To be alone in such a place and at such an altitude must always be very impressive to the traveller, no matter what his temperament; and, on the whole, I was very glad that my guides had gone. The deep snow made the return trip around the crater very fatiguing, for at no

<sup>1</sup> I have sometimes been asked how the sky appears at these great altitudes. It looks darker than at sea-level, but will not so much so as one might at first suppose. The story that the sun set visible in the daytime from high mountain summits is entirely unsupported by the facts.



ILLAMPU (THE HIGHEST OF THE ANDES), AND THE SORATA RANGE, SEEN OVER LAKE TITICACA.

From a photograph by William H. Pickering.





time were we at a less elevation than 19,000 feet above the sea. On returning to the camp I found a note from my companions, stating that they had started for home; so I also at once began the descent.

If the mountain was hard to climb, it was certainly one of the easiest of descent that I have ever known. The motion was almost like skating, the loose stones rattling and sliding after one, and the finer particles following in a cloud of dust. Each step was between one and two yards in length, and I reached the base of the cone from the edge of the crater inside of fifty minutes. The *tambo* was reached half an hour later, and I had descended over 5,000 feet inside of one hour. That night we passed at the *tambo*, and the next day returned to Arequipa, none the worse for our adventures.

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As the subject of mountain sickness seems to be attracting much attention at the present time, some further results of our experience in this region may be found interesting. In 1892 we established a camp upon Mt. Chachani, at an altitude of 16,600 feet. Here we had a stone hut built with a bridle-path leading to it. Many persons visited this camp in company with myself or my assistants, and thus we had an opportunity to witness many phases of the complaint. The commonest symptom was a severe headache, with a disinclination to move about. This was sometimes accompanied by nausea, and in one instance by a temporary loss of memory. I remember a case which occurred upon Pike's Peak, where the victim became temporarily delirious; but this I think is very unusual. The sickness seems to be brought on by hard work, or by eating a hearty meal. At these altitudes one seldom feels very hungry, and a dinner consisting of a little broth and some fruit is all that is needed, and seems to be all that one can digest. Meat should in general be avoided. It sometimes happened that a visitor would feel remarkably well on arriving at the camp, would walk around briskly, laugh at mountain sickness, perhaps smoke a cigarette, eat a hearty dinner, and inside of fifteen minutes would be stretched out flat on his back. Our expe-

signs was that if one felt uncommonly well and lively, this itself was a symptom of the complaint. Recovery was sometimes rapid, but usually the case went from bad to worse, especially as night approached. The following morning the sufferers would usually feel better. We found that all persons with blood of the white race in their veins were subject to the complaint, the pure-blooded Indians only being more or less exempt. Half-breeds who had spent all their lives in Arreкипа were often more susceptible to it than ourselves.

In my own case this susceptibility rapidly wore off, and after my first night on the Mesa I never again felt any very serious inconvenience. Shortly before my return to the United States I made an attempt to ascend Chachani; and had it not been for an accident to a member of our party, we should probably have succeeded in our attempt. As it was, I reached an altitude of about 10,000 feet without any pronouncement of mountain sickness. One of my assistants, on the other hand, thought that the tendency to the complaint increased with the length of his stay in Arreкипа. Although more or less like sea-sickness in its symptoms, immunity from the one by no means promises freedom from the other.



































































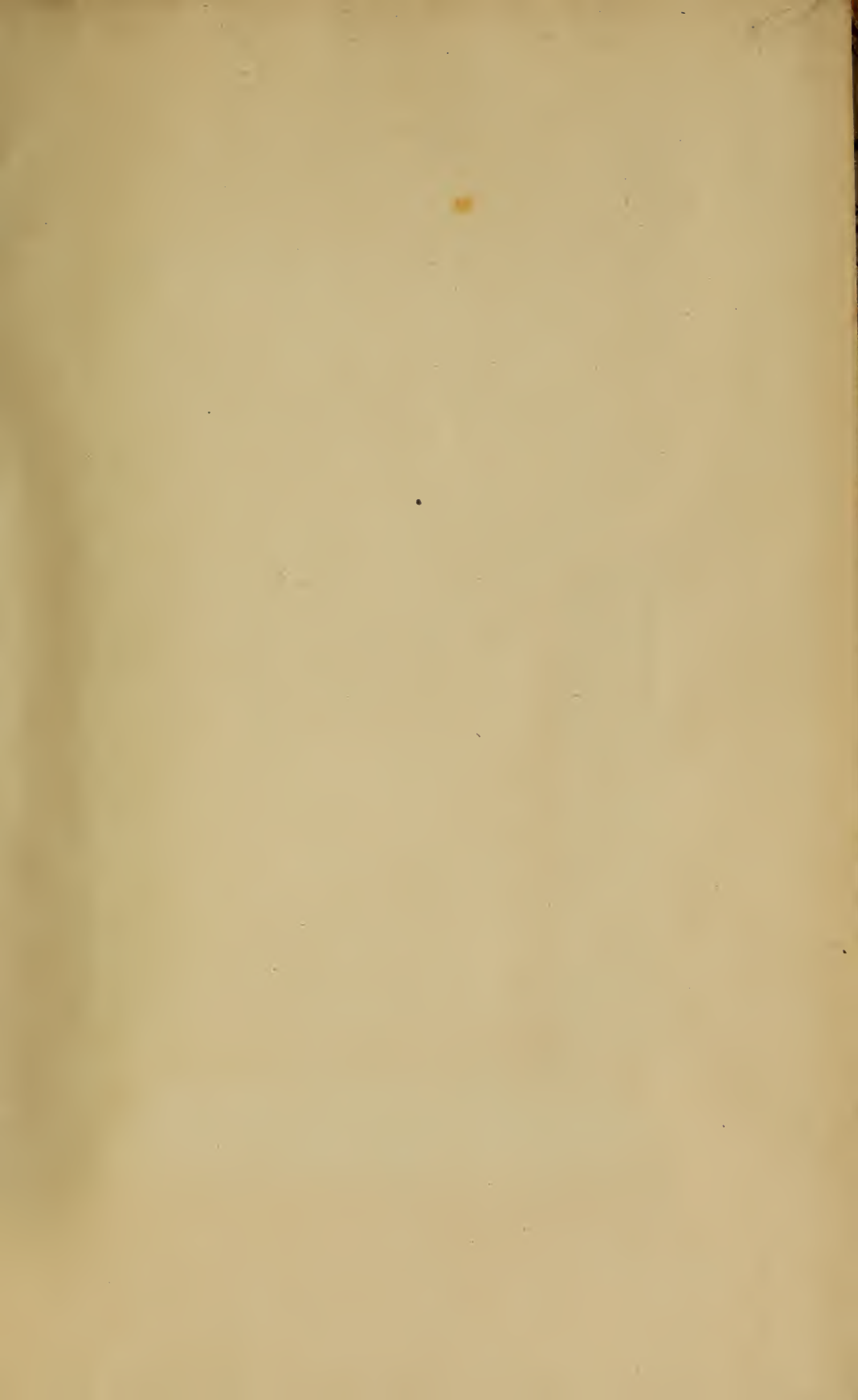














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